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Household Incomes and Internet Connection Rates: Exploring the associations

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RESEARCH AIM

To explore correlations between levels of household income and Internet connection rates across three geographical areas in the NT and compare to the rest of Australia for 2011.

We use 2011 Census data comparison rates between Indigenous and non-Indigenous households by household income levels to assess social policy implications associated with Internet access.

KEY FINDINGS

- Improving rates of Internet connections are seen by governments globally as a means for garnering economic growth and addressing social disadvantages. Most data shows connection rates to be highly associated with income levels.
- In this study comparing the Northern Territory to the rest of Australia, significant correlations between household incomes and Internet connection rates were evident for both Indigenous and non-Indigenous households in 2011.
- Income and Internet connection rate disparities between low income remote NT households and high income households in Greater Darwin were most noticeable.
- Almost 90% of high income households in the Territory in 2011 had an Internet connection of some type compared to just 30% of very low income households.
- Connection rates were highest in Greater Darwin, followed by the Territory Midtowns (Alice Springs, Katherine, Tenant Creek and Nhulunbuy combined). Rates were lowest in the Rest of the NT (all other areas combined, outside of Greater Darwin and the Midtowns).
- Results were quite consistent between the Northern Territory and the rest of Australia.
- Persisting relatively lower incomes for remote Indigenous households highlights the need for ongoing government subsidisation of Internet services to remote communities as well as facilitating rollout of improved technologies including NBN assisted infrastructure and future downstream technologies.

I. Introduction

Historically, rates of Internet connections for Indigenous households in the Northern Territory have been lower than for non-Indigenous households. In explaining why this might be the case, researchers have identified several supply-side issues including remoteness, technological constraints and infrastructure costs (Daly, 2001). On the demand-side scholars have suggested the nature of Internet use and application as being individualistic, in opposition to Indigenous cultural and societal norms (for example, Brady et al., 2008). Language and literacy barriers have also been identified as factors contributing to relatively low uptake rates in remote areas. Others have challenged these suppositions in light of the recent (2006 onwards) rollout of Broadband Internet infrastructure at remote Indigenous communities in the NT and elsewhere (for example, Taylor, 2012b, Dyson and Underwood, 2006) which saw extremely high uptake rates of Internet enabled mobile phones, and particularly amongst the younger generation. Rapidly expanding uptake rates are also seeing Internet based technologies increasingly utilised to record, store and represent Indigenous cultural elements in the form of audio files, texts, photos, videos, maps and lists relating to land, clan, ancestral and other facets 'in-place' (Verran and Christie, date unknown).

Incomes are universally lower in the remote parts of developed nations and, as such, have been perceived as a major barrier to more widespread technology adoption. Research by Taylor (2012a and 2012b) and Bandias (2010) has outlined the social and economic importance of increasing Internet access for Indigenous people in remote areas of the Northern Territory. Taylor (2012a) explored whether and how a range of technology developments had impacted on the lives and aspirations of residents. He suggested that the instillation of Broadband towers at even the most remote communities had created technological 'leapfrogging' and provided opportunities for young people to engage with the global information network.

This research brief extends our study on trends and variations in Internet connection rates reported in the brief [Closing the Technology Gap? Changing rates of Internet connections in the Northern Territory from 2006 to 2011](#). The availability of 2011 Census data facilitates updated reporting on household Internet connection rates and household incomes. In this brief we specifically examine associations between household incomes and Internet connection rates. We compare and contrast connection rates across three geographical regions within the NT to the rest of Australia to assess the social policy implications associated with internet access and discuss how the rollout of the National Broadband Network (NBN) might affect household connections.

In July 2014, NBN Co announced its new NBN Co Satellite Support (NSS) Scheme to help increase the availability of Internet connections to households in rural and remote locations of Australia where there is no access to a commercial broadband internet service until the expected launch of NBN Co's Long Term Satellite Service (LTSS) in late 2015. The NSS Scheme includes speed and availability service levels; equipment, support and maintenance; and data plans for eligible customers between the consumer and the service provider (NBN Co, 2014a). However, NBN Co will be the service provider for the LTSS, unlike the NSS Scheme which is delivered by wholesaler, IP Star and other Internet Service Providers. Households outside of the Darwin Council area in communities such as Berry Springs, Darwin River, Lambells Lagoon, Fly Creek North, Wagait Beach,

Livingston South and Southport can access the Internet via NBN Co's fixed wireless installations (NBN Co, 2014b).

The research questions for this study are:

- How does the NT compare to the rest of Australia regarding Internet connection rates and household income levels?
- How do connection rates and household incomes differ between Indigenous and non-Indigenous households in the Northern Territory?
- What are the relationships between household income and household income levels by region?
- What implications can be established on the uptake of internet connections given the rollout of the National Broadband Network (NBN)?
- What implications might we suppose for social policy reform?

2. Methods, data sources and geography

This research is based on data from the 2011 Census of Population and Housing, extracted using the Australian Bureau of Statistics (ABS) custom software TableBuilder (ABS, 2011). The Census recorded the types of Internet connections the household had, if any. The incomes of individuals who were residents of the household are aggregated to form household income. This permits the analysis of associations between incomes to Internet connection rates using the variables Type of Internet Connection (NEDD) and Equivalised Household Income (HIED). The latter is total household income adjusted by an "equivalence scale" to facilitate a comparison of income levels between households of differing size and composition for comparative data analysis (ABS, 2011). HIED was customised into four cohorts as shown in Table 1.

Table 1. Classification of Total Household Equivalised Income (weekly) – 2011

Customised cohorts of HIED Household Income Equivalised (weekly) 2011		
Household Income	2011 Income (weekly)	Annual Income
Very low	\$0-299	\$Negative, 0-\$15,599
Low	\$300-599	\$15,600-\$31,199
Middle	\$600-999	\$31,200-\$51,999
High	\$1000 or more	\$52,000 or more

Source: Australian Bureau of Statistics, *Census Dictionary Australia 2011*.

Correlations were established using Pearson's Correlation Coefficient in MS Excel. For this we utilised the full HIED classification rather than the customised version shown in Table 1.

Table 2 explains the types of connections associated with the reporting fields for NEDD and used to report the results in this study.

Table 2. Types of Internet Connections (NEDD)

Types of Internet Connections - Counting Dwellings, Place of Enumeration database
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Broadband connection	ADSL, Cable, Wireless, Satellite, Fibre and Mobile connections
Dial-up connection	Includes Analog modem and ISDN connections
Other connection	'Other' connection is Internet access through mobile phones, etc.

Source: Australian Bureau of Statistics, *Census Dictionary Australia 2011*, cat no. 2901.0, Belconnen, ACT.

The geographical areas for the research were the Northern Territory, the Rest of Australia (ROA) and three geographical regions within the Northern Territory (Greater Darwin, the Midtowns and the rest of the NT). We constructed the geographies using custom aggregations of Statistical Area Level 2 (SA2) units as follows:

- Greater Darwin – all SA2s in the Darwin, Palmerston and Litchfield municipalities
- Territory 'Midtowns' – the combined populations of the SA2s which comprise the towns of Alice Springs, Katherine, Tenant Creek and Nhulunbuy (excluding Jabiru due to geographic boundary changes from 2006 2011)
- The rest of the Northern Territory (RoNT) – all remaining NT SA2s outside of Greater Darwin and the Midtowns
- The Northern Territory (all SA2s in the NT)
- The Rest of Australia (all other parts of Australia) – all SA2s outside of the NT

We examined Indigenous and non-Indigenous households separately using the household variable Indigenous Household Indicator (INGDWTD) which codes households with at least one Indigenous person usually resident as an Indigenous household (ABS, 2011).

3. Results

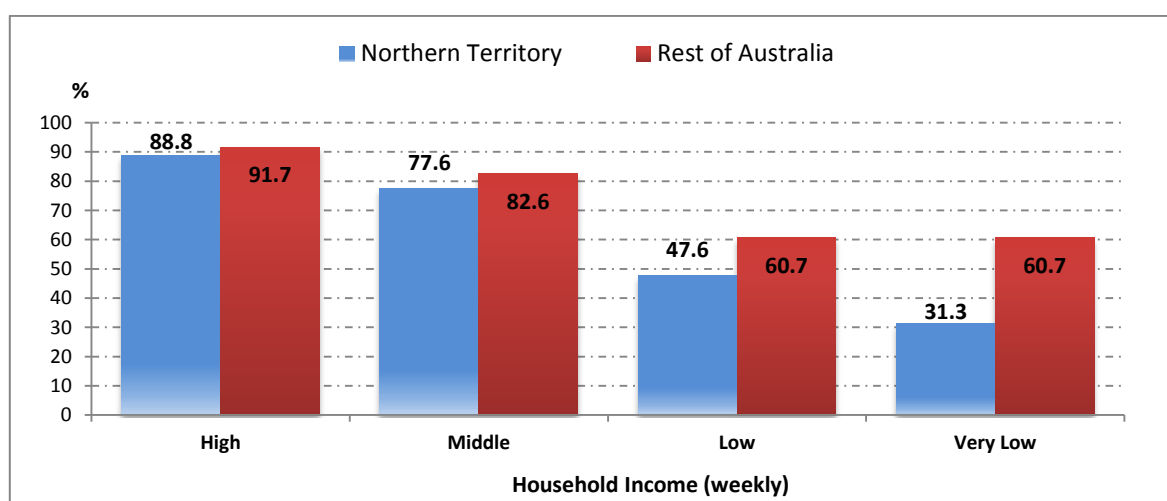
3.1 Summary indicators for income and Internet connections

In 2011, a far greater proportion of households in the NT were high income (51%) than for the ROA (36%), nevertheless, a lower proportion in the Territory had an Internet connection of some type (89% compared to 92% for RoA) (Table 2 and Figure 1). While the proportion of all households who could be considered as low income households in 2011 were similar for the NT and RoA, there was a far greater spread of Internet connection rates between low income and high income households in the Territory.

Table 3. Household Internet and Income distributions, 2011

Income level (weekly)	Internet connection rates NT	NT Income distributions	Internet connection rates RoA	RoA Household Income distributions
High (\$1,000+)	88.8	26,620 (51%)	91.7	2,454,063 (36%)
Middle (\$600-\$999)	77.6	11,780 (22%)	82.6	1,789,204 (26%)
Low (\$300-\$599)	47.6	9,062 (17%)	60.7	1,990,932 (29%)
Very Low (\$Neg, \$0-\$299)	31.3	4,968 (10%)	60.7	644,590 (9%)
Total		52,430		6,878,789

Figure 1. NT and Rest of Australia - Percentage of Households with Internet connection by Household Income group, 2011



Source: Australian Bureau of Statistics (ABS) Census 2011, ABS Table Builder. 2011.

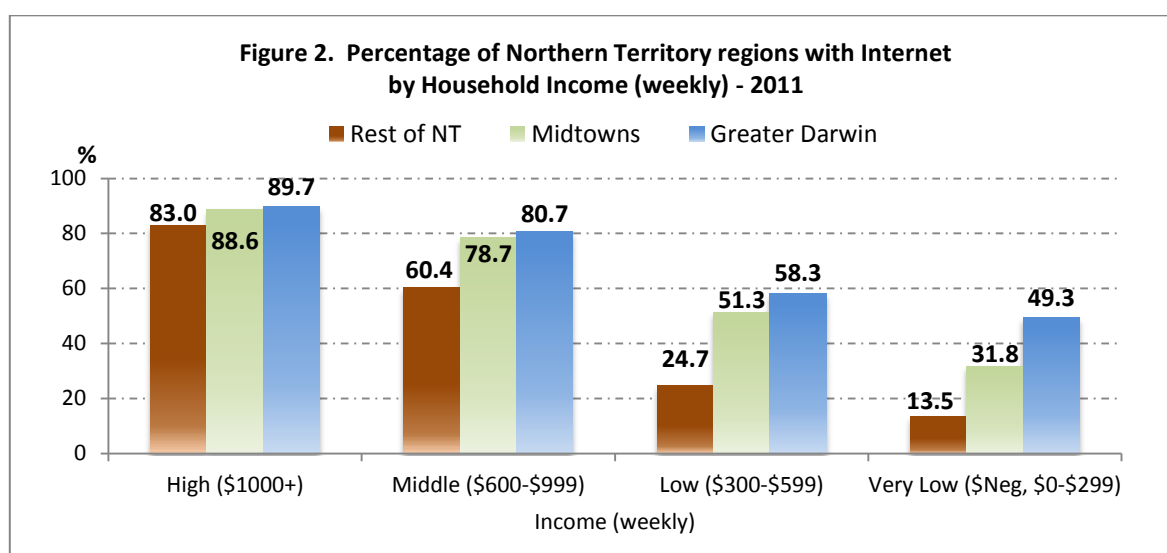
3.2 Comparison of Internet connection rates and income – Northern Territory regions

In 2011, an inverse relationship between Internet connection rates and household incomes was evident (Table 3 and Figure 2). Household connection rates for Greater Darwin and the Midtowns were similar for high income households (90% and 89% respectively) and middle income households (81% and 79%). Similarly, for the rest of the NT, 83% of high income households had an Internet connection. Low and very low income households in the rest of NT stand out with connection rates at just 25% and 14% respectively in 2011.

Table 4. Northern Territory regions - Percentage of Households with Internet connection by Household Income, 2011

Household Income (weekly)	Rest of NT (%)	Midtowns (%)	Greater Darwin (%)
High Income (\$1000+)	83.0	88.6	89.7
Middle Income (\$600-\$999)	60.4	78.7	80.7
Low Income (\$300-\$599)	24.7	51.3	58.3
Very Low Income (\$Neg, \$0-\$299)	13.5	31.8	49.3

Figure 2. Northern Territory regions - Percentage of Households with Internet connection by Household Income, 2011



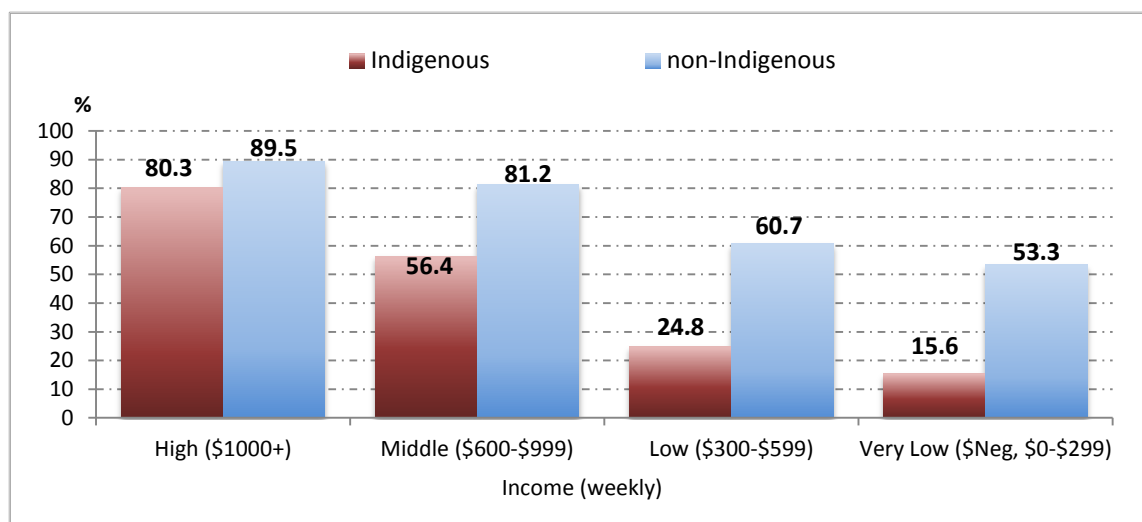
Source: Australian Bureau of Statistics (ABS) Census 2011, ABS Table Builder. 2011.

3.3 Comparison of connection rates and type of household – NT Regions

By 2011, approximately 41% of all Indigenous households in the Northern Territory had Internet connections compared to 81% of non-Indigenous households (Henderson, Salmon and Taylor, 2014). A comparison of Internet connection rates to household income (weekly) across the three Northern Territory regions reveals a disparity between Indigenous and non-Indigenous households for those with very low, low or middle income levels (Figure 3). However, connection rates were similar for both household types with high incomes. Over 81% of non-Indigenous middle income households had Internet connections compared to 56% of Indigenous households. Gaps in connection rates between the two household types significantly increased as household income levels lessened. Overall, non-Indigenous households had much higher connection rates than

Indigenous households in 2011, although rates for Indigenous households improved markedly from 2006 to 2011 (see Henderson, Salmon & Taylor, 2014).

Figure 3. Percentage of Northern Territory Indigenous and non-Indigenous households with Internet connection by Household Income (weekly) 2011



Source: Australian Bureau of Statistics (ABS) Census 2011, ABS Table Builder. 2011.

3.4 Correlations for Indigenous and non-Indigenous households

An analysis of results of Internet connection rates, household income levels and the two types of households (Indigenous or non-Indigenous) for the 2011 Census was conducted using Pearson's correlation coefficient, r , in MS Excel. The results revealed there is a strong and significant inverse relationship between household income and Internet connection rates for all three NT regions and for the rest of Australia, regardless of household type, but with a stronger relationship for Indigenous households (Table 4).

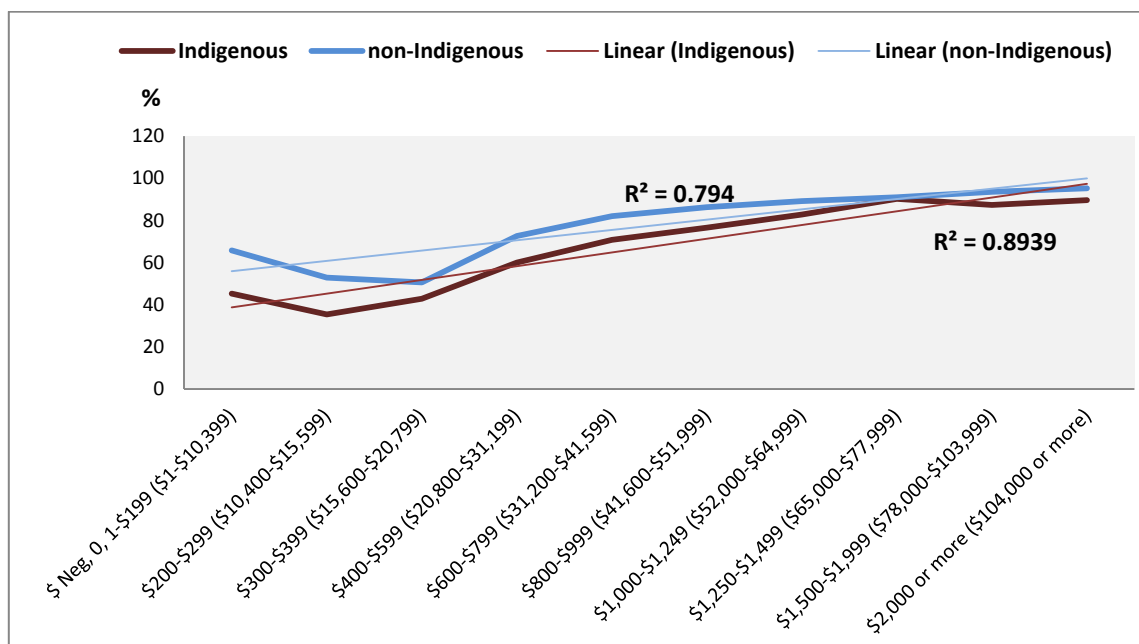
Table 5. Results of analysis of Household Income, Internet connection and Household Type, 2011

Geographic Region	Indigenous Households with Internet connection	Non-Indigenous Households with Internet connection
Greater Darwin	$r^2 = 0.89$	$r^2 = 0.79$
Midtowns	$r^2 = 0.95$	$r^2 = 0.65$
Rest of NT (RoNT)	$r^2 = 0.94$	$r^2 = 0.81$
Northern Territory	$r^2 = 0.95$	$r^2 = 0.78$
rest of Australia	$r^2 = 0.92$	$r^2 = 0.78$

Source: ABS Census 2011, ABS Table Builder, 2014

In Greater Darwin there was strong relationship between household income Internet connection rates for Indigenous households ($r^2=0.89$), while the association non-Indigenous households ($r^2=0.79$) was less significant (Figure 4).

Figure 4. Greater Darwin – Indigenous and non-Indigenous Households with Internet connections and Household Income (weekly), 2011



Source: ABS Census 2011, ABS Table Builder, 2014

Midtowns

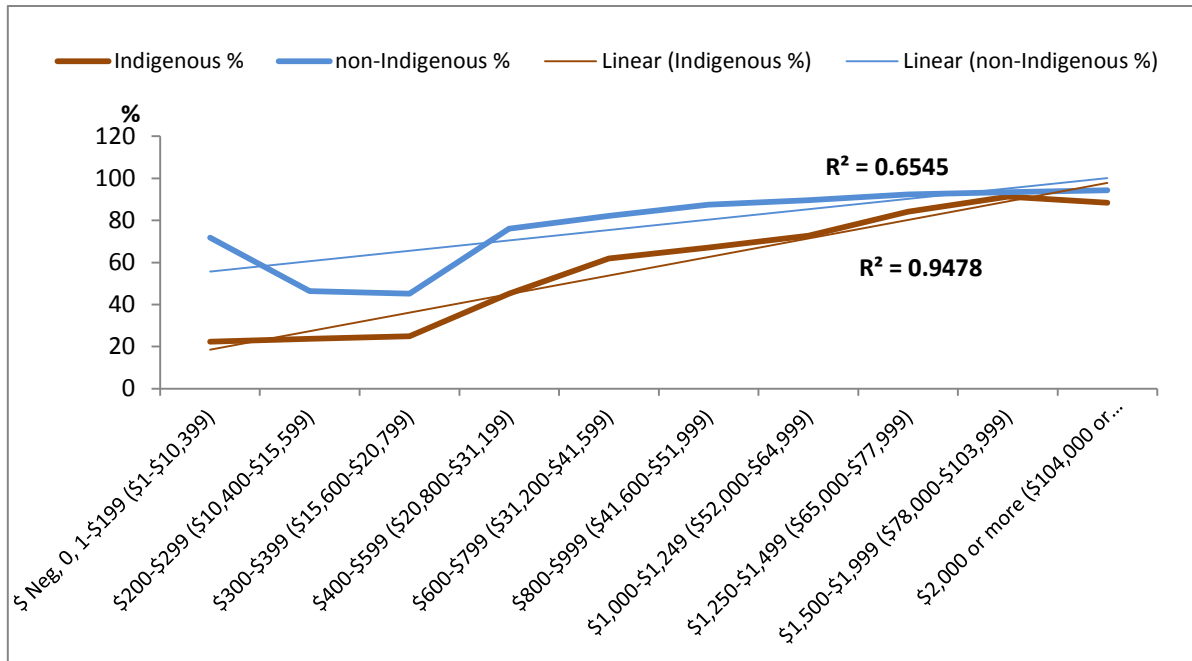
There is a very strong relationship between households with an Internet connection and household income for Indigenous households in the Midtowns ($r^2=0.94$). It was not so strong for non-Indigenous households ($r^2=0.65$) (Table 6 and Figure 5).

Table 6. Midtowns - Percentage of Indigenous and non-Indigenous Households with Internet connections and Household Income (weekly), 2011

Income (weekly)	Indigenous %	Non-Indigenous %
\$ Neg, 0, 1-\$199 (\$1-\$10,399)	22.3	71.8
\$200-\$299 (\$10,400-\$15,599)	23.6	46.5
\$300-\$399 (\$15,600-\$20,799)	24.9	45.1
\$400-\$599 (\$20,800-\$31,199)	45.2	76.1
\$600-\$799 (\$31,200-\$41,599)	62.0	82.2
\$800-\$999 (\$41,600-\$51,999)	67.1	87.5
\$1,000-\$1,249 (\$52,000-\$64,999)	72.7	89.7
\$1,250-\$1,499 (\$65,000-\$77,999)	84.2	92.4
\$1,500-\$1,999 (\$78,000-\$103,999)	91.3	93.5
\$2,000 or more (\$104,000 or more)	88.5	94.4

Source: ABS Census 2011, ABS Table Builder, 2014

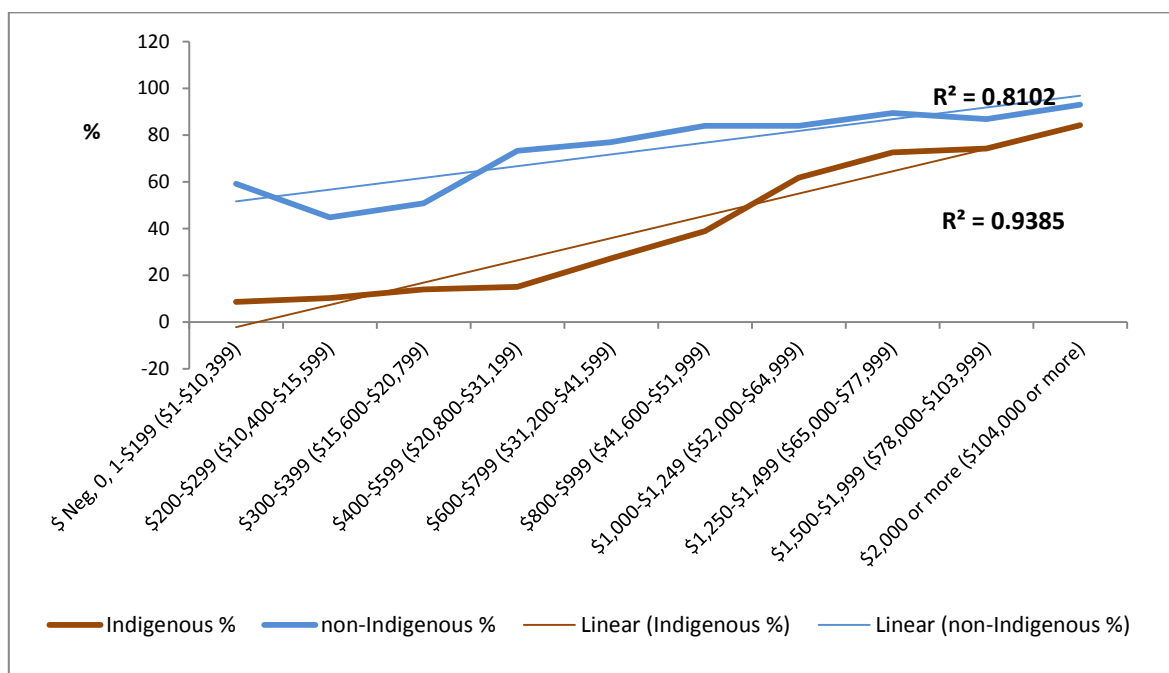
Figure 5. Midtowns – Indigenous and non-Indigenous Households with Internet connections and Household Income (weekly), 2011



Source: ABS Census 2011, ABS Table Builder, 2014

Analysis of the results for the rest of the Northern Territory revealed a significant correlation between household income for Indigenous households with Internet connections ($r^2=0.93$) as shown in Figure 6.

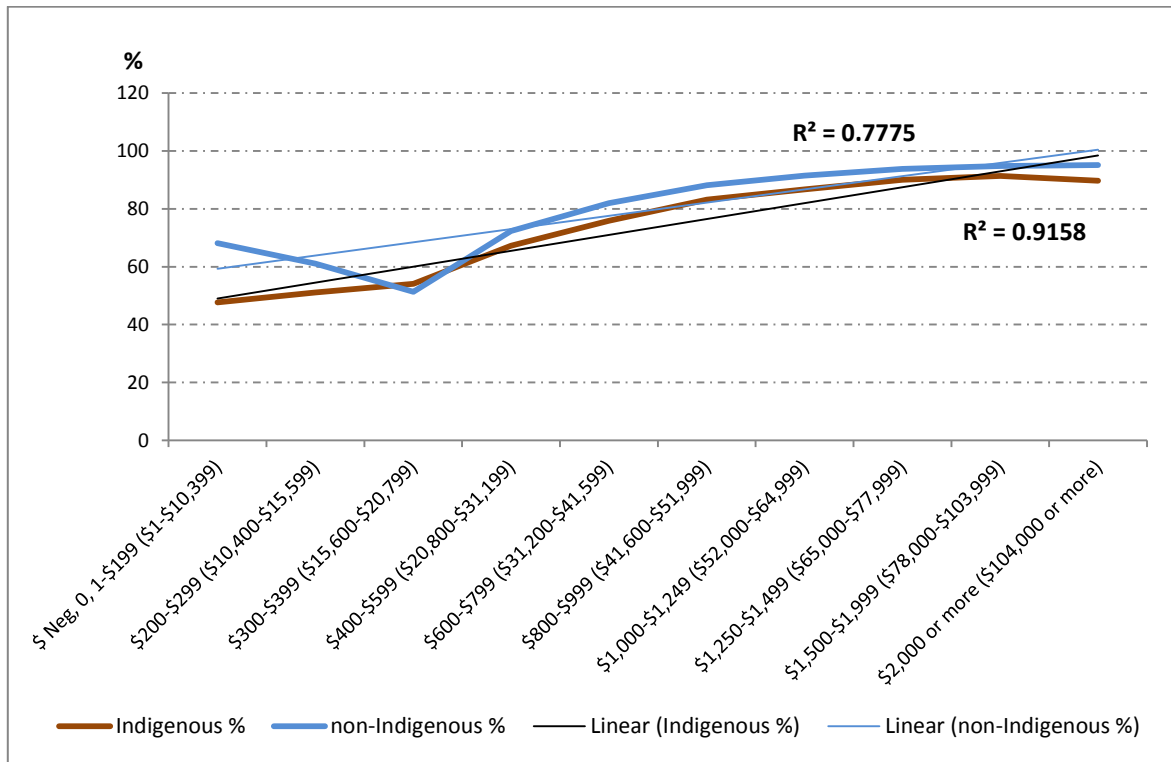
Figure 6. Rest of NT – Indigenous and non-Indigenous Households with Internet connections and Household Income (weekly), 2011



Source: ABS Census 2011, ABS Table Builder, 2014

Results for the rest of Australia also showed a significant and strong correlation between household income and Internet connection rates for Indigenous households ($r^2=0.91$), however this was weaker for non-Indigenous households ($r^2=0.77$) as seen in Figure 7.

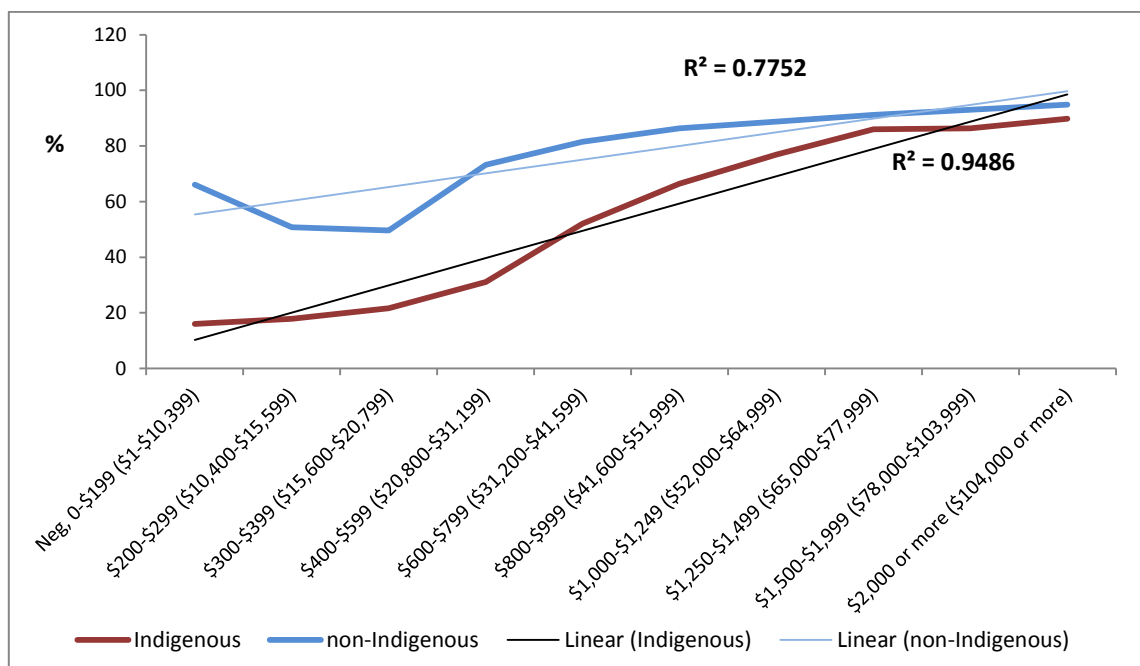
Figure 7. rest of Australia – Indigenous and non-Indigenous Households with Internet connections and Household Income (weekly), 2011



Source: ABS Census 2011, ABS Table Builder, 2014

Results for the Northern Territory overall were very similar to the rest of Australia for both household types, with a significant and strong relationship between household income and Internet connections for Indigenous households ($r^2=0.94$). A relatively weaker relationship was likewise revealed for non-Indigenous households ($r^2=0.77$) as shown in Figure 8.

Figure 8. Northern Territory region – Indigenous and non-Indigenous Households with Internet connections and Household Income (weekly), 2011



Source: ABS Census 2011, ABS Table Builder, 2014

4. Conclusion

This brief has examined the differences in rates of Internet connections based on household incomes and the type of household. We compared and contrasted these across three regions within the Northern Territory to the rest of Australia using 2011 Census data, which is the most recent source of data for this purpose.

The results indicate –

- A very strong, significant and similar relationship between household income and Internet connection rates for Indigenous households in all Northern Territory regions and the rest of Australia ($r^2=0.9$ or above in all cases).
- The Northern Territory and the rest of Australia had very similar results and correlations between household income and Internet connections for both Indigenous ($r^2=0.9$) and non-Indigenous ($r^2=0.78$) household types and were closely comparable to the Greater Darwin region.
- Of all regions and household types, the Midtowns Non-Indigenous households had the lowest correlation ($r^2=0.65$) between household income and household Internet connections.

This has social implications particularly for very low and low income households without Internet connections as they are unable to exploit the social, economic, educational and job opportunities available with internet connection of some type. With the high cost of living in remote parts of the

Northern Territory, real disposable incomes are at levels which place households at a disadvantage in terms of accessing information and opportunities via the Internet.

Nevertheless, access and uptake rates for remote communities continue to improve and we can expect residents in remote Indigenous communities to continue to adopt more complex Internet-based functionalities (for example, internet based purchasing, educational and travel related functions and entertainment). In the meantime, in recognition of the clear disparity in income distributions and Internet connection rates for low income NT households, and especially those in remote areas, government policy should focus on providing such opportunities. Suggested approaches include a continuation of the direct subsidisation of services to remote communities and facilitating the rollout of improved technologies including NBN assisted infrastructure and future downstream technologies.

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